

In the biological section the author deals mostly with the land faunas and floras; for their evidence is naturally the most significant regarding former land connections. But the marine fauna also gives weighty evidence. The writer pointed out in 1891 that the relations of the echinoid faunas of North America and Europe gave convincing evidence of a middle Cainozoic land connection across the Atlantic; and the position then indicated for the North Atlantic shores from the migrations of the sea urchins corresponds to the general position assigned to it by Dr. Arlt from the migrations of land animals. In his statement of the biogeographical evidence, Dr. Arlt follows the method of Blanford's fine address to the Geological Society in 1890. He considers the existing distribution of each group of land organisms in connection with its geological history and with the probable distribution of land and water on the earth during its development. He illustrates the land routes available for migration at successive periods in the history of a group by an ingenious series of diagrams (e.g. plate ii.). Dr. Arlt devotes 300 pages to a summary of our knowledge as to the geographical distribution of Cainozoic life. For the existing biological regions he adopts the division into three, and the names he uses suggest the age of the faunas and floras that inhabit them. The Holarctic region he names Kainogæa, on account of the modern character of its life; the Ethiopian and Oriental regions he groups together as Mesogæa; and for the remaining regions, including Australasia, Madagascar, and the Neotropical region, he adopts, with a modified meaning, Dr. Sclater's name, Palæogæa, as the region is characterised by ancient life.

The author then deals similarly with the distribution of Mesozoic and Palæozoic life, and the former continental unions thus proved. He quotes widely from literature, and numerous references show his indebtedness to the works of Lydekker.

The second main division of the work is geological, and here the author is largely dependent upon the work of Suess. He summarises the evidence from the various former continents, including North Atlantis, South Atlantis, Angaraland, Gondwanaland, the larger Oceania and Antarctica. He then describes the seven chief Archæan massifs, the ancient coigns of the earth, which have remained unbroken since the earliest geological times, and have guided the course of the earth-folds that formed the chief fold-mountain lines of the earth.

The section on historical geology summarises the chief geographical incidents and the characters of the life of each of the geological systems, and insists on the periodicity in the dominant phenomena. The author's conclusions, though probably right in the main, perhaps overstate the regularity of the periodicity. For instance, he divides known geological history into six cycles—the Cainozoic-Mesozoic, Upper Palæozoic, Middle Palæozoic (Lower Devonian and Silurian), Lower Palæozoic (Ordovician and Cambrian—the author, however, does not adopt the former term), the Algonkian, and the Urschiefer. Each cycle he represents as beginning with a marine transgres-

sion, followed by a period of fold-mountain formation, and then by vast eruptions of basic volcanic rocks, and each cycle closes with a Glacial period. He accepts six Glacial ages, viz. one in the lower and one at the top of the Algonkian, and others in the Upper Ordovician, Lower Devonian, Permian, and Pleistocene. The evidence for these six glaciations is not yet convincing.

Dr. Arlt traces, too, in the last pages of his work the influence of the former land distribution on the distribution of human races. He assigns the original home of mankind to the area north of the Himalaya. As land distribution at the arrival of man was in broad outlines essentially the same as now, the migrations of man, as is shown in the last of Dr. Arlt's admirable series of charts, followed the existing land lines. The woolly-haired races spread from Southern Asia into Africa and Melanesia; the stiff-haired Malays crossed over-sea from Malaysia to Madagascar and the islands of the Western Pacific (the author unfortunately includes the Maoris as Malays), and the allied Mongols occupied northern Eurasia and America. The members of the author's last group, including the Indo-Germanic, Semitic and Hamitic peoples, and Dravidians, Veddas and Australians, overran southern Europe and northern Africa, while one section of it passed through the Malay Archipelago to Australia.

Dr. Arlt's work is extensive, comprehensive—the index occupies ninety-eight pages—and ambitious. Probably not one of his readers will agree with it all. The chapters are necessarily of unequal value. Among his classifications of animals, e.g., that of the Echinoderms on his phylogenetic chart of that group, he adopts a now out-of-date system from von Zittel's textbook of 1883. But the work is of great value; it is original, suggestive, and, taken as a whole, we think sound. It is the fullest statement yet issued of the doctrines of a school of geological thought which appears to be making steady progress, and it shows the necessity for the combined study of palæontology, geology, and petrography in discovery of the actual history of the geography of our earth.

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BOTANY ON THE VOYAGE OF THE "VALDIVIA."

Wissenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia," 1898-1899. Edited by Prof. C. Chun. Vol. ii., Part i., No. 2, Beiträge zur Kenntniss der Vegetation der Canarischen Inseln. By H. Schenck. Pp. 180; with 12 plates. Price 45 marks. Vol. ii., Part ii., No. 3, Das Indische Phytoplankton. By G. Karsten. Pp. 326; with 25 plates. Price 70 marks. (Jena: Gustav Fischer, 1907.)

THE second volume of these memoirs has been assigned to the botanical results of the *Valdivia* expedition. The first part deals with insular floras, the second with marine floras, and there will be an account of plants collected in countries visited on the

mainland. Dr. H. Schenck is responsible for the account of the Canary Islands, as he was for the previous numbers referring to the islands of Kerguelen, St. Paul, and New Amsterdam; but much of the text and a few of the illustrations are again the work of the late Prof. A. F. W. Schimper, who was botanist to the expedition. The character sketches written by Prof. Schimper bear that particularly vivid impress and breadth of view that characterise "Die Pflanzen-geographie." Certainly he has a most fascinating subject, as the flora of the islands is rich in curious endemic plants.

The zones of vegetation as developed on the island of Teneriffe are fairly typical for the group. Schimper distinguishes three regions, basal, montane, and alpine. The basal region is the most extensive; here are found the weird arboreal monarch of the island, *Dracaena Draco*, the dragon's blood tree, showing at first an unbranched stem with tiers of horizontal leaves, but developing later a much-branched system; the candelabra-like *Euphorbia canariensis* and a date palm, *Phoenix Jubae*, the fruits of which provide food for birds but not for man. These are the dominant endemic species, but there are many others, succulent species of *Euphorbia*, *Ceropegia*, *Echium*, &c., and xerophytes characterised by a mass of thin, whip-like branches and narrow leaves, of which *Plocama pendula* furnishes a type. The proportion of endemics in the coastal vegetation is about one-third, a large number being species of *Statice*.

In the montane region Schimper notes particularly the laurel forest, where *Laurus canariensis*, *Erica arborea*, *Ilex canariensis*, and *Ocotea bullata* hold sway. Great interest attaches to several of these, because they are evidently closely connected with Tertiary fossil forms found in European countries. *Pinus canariensis* gives character to the landscape at 5000 feet, while higher *Spartocytisus supranubius* is almost the sole occupant of the black, stoney slopes. The volume is altogether *un embarrass de richesse*, with copious illustrations, some in heliogravure, others interspersed with the text. Not the least pleasing feature is the generous manner in which Dr. Schenck has subordinated his work to that of his former colleague.

The study of phytoplankton is, for obvious reasons, a more exclusive subject, but the results given in the two volumes of text and plates are full of interest. Two earlier accounts treated of the gatherings taken in the Antarctic and Atlantic, while the plankton of the Indian Ocean is here under discussion. It was found that a definite limit to the Antarctic region could be set at Kerguelen Island. As the ship proceeded northwards the character of the plankton changed, species of *Ceratium* and *Peridineæ* generally becoming more numerous. Off Sumatra an increase of diatoms and *Schizophyceæ* connected with the increased food supply furnished evidence of coastal plankton mixed with the oceanic forms. Respecting vertical distribution, it was noted that in tropical waters the mass of plankton exists in the upper six hundred feet, while at twelve hundred feet living forms practically cease. The morphological details at the end of the volume

include notes on diatom microspores, the formation of the rays in certain of the *Peridineæ*, and some life-histories. A final word of commendation must be bestowed on the volume of exceptionally fine drawings that have been skilfully reproduced.

SOME NEW CHEMICAL BOOKS.

- (1) *A Systematic Introduction to Analytical Chemistry*. By A. F. Walden and B. Lambert. Pp. vi+176. (Oxford: J. Thornton and Son, 1908.) Price 3s. 6d.
- (2) *Naturlehre für höhere Lehranstalten*. I. Teil. Chemie, Mineralogie, und Geologie. By Dr. F. Dannemann. Pp. viii+225. (Hanover and Leipzig: Hahnsche Buchhandlung, 1908.) Price 2.80 marks.
- (3) *Organic Chemistry*. Including certain portions of Physical Chemistry for Medical, Pharmaceutical, and Biological Students. By H. D. Haskins and J. J. R. Macleod. Pp. xi+367. (New York: J. Wiley and Sons; London: Chapman and Hall, Ltd., 1907.) Price 8s. 6d. net.
- (4) *Stereochemie, die Lehre von der Räumlichen Anordnung der Atome im Molekül*. By Dr. L. Mamlock. Pp. vi+152. (Leipzig: B. G. Teubner, 1907.) Price 5 marks.

(1) **ALTHOUGH** there is perhaps no branch of chemistry which at the present day is more stagnant than analysis (of the academic as distinguished from the technical kind), there are always to be found teachers whose interest in the subject will prompt them to publish their experiences. With this interest we have the greatest sympathy, for there is no doubt that the skill, neatness, intelligence and patience which analysis demands will always appeal to the chemist. Analysis is, in fact, his handicraft, just as much as the using of a lathe or a planing machine is that of the mechanical engineer, with this difference: that whilst the engineer may employ a mechanic to do his practical work, the chemist must always be his own analyst.

When we approach the question of the place of analysis in chemical teaching, we put the subject at once on a different plane and see it in a different perspective, for as students of chemistry are not all to be professional chemists, we have to consider analysis as merely a part of chemical teaching. There is no doubt that there has been a tendency for the subject to assume an exaggerated value. We inherited the tradition of the Stockholm Laboratory, and continued it because it adapted itself to practical examinations in chemistry. We do not believe any more than the authors "that the neglect of qualitative analysis is either necessary or desirable," but there is a great difference between learning the principles of the process and studying it as a part of the technique of the professional chemist. For the ordinary student there seems no object in discovering and identifying such uncommon combinations as meta- and pyro-phosphoric acid, fluosilicates or perchlorates. The range of practical chemistry has so increased of late that it has become more than ever imperative to restrict the study of one branch if it encroaches on the time which